CLAIMS

What is claimed is:

1. A pulse light drive circuit for semiconductor metrology apparatus, comprising:
   (a) a pulse light source;
   (b) an energy source connected to the pulse light source;
   (c) a light detector positioned to receive pulse light from the pulse light source; and
   (d) a drive circuit connecting the pulse light source, energy source and light detector, the drive circuit further comprising a signal processing circuit, and a cut-off switch adapted to cut off energy from the energy source to the pulse light source after a predetermined pulse light integrated intensity level is detected by the light detector.

2. A pulse light drive circuit for semiconductor metrology apparatus according to claim 1, wherein the energy source comprises a capacitor, and the signal processing circuit further comprises an integrator and a threshold comparator.

3. A pulse light drive circuit for semiconductor metrology apparatus according to claim 1, wherein the light detector further comprises a filter element.

4. A pulse light drive circuit for semiconductor metrology apparatus according to claim 3, wherein the filter element comprises a wavelength selective element.

5. A pulse light drive circuit for semiconductor metrology apparatus according to claim 2, wherein the light detector produces a pulse light intensity signal, and the integrator integrates the pulse light intensity signal into an integrated light intensity signal.

6. A pulse light drive circuit for semiconductor metrology apparatus according to claim 2, wherein the cut-off switch further comprises a trigger switch connected between the threshold comparator and the capacitor.

7. A pulse light drive circuit for semiconductor metrology apparatus according to claim 6, wherein the pulse light source generates a light pulse having a predetermined duration, and the trigger switch cuts off energy to the pulse light source when the integrated light intensity signal reaches a predetermined level.

8. A pulse light drive circuit for semiconductor metrology apparatus according to claim 1, wherein the cut-off switch is connected between the energy source and the pulse light source, and the signal processing circuit further comprises an integrator connected between the light detector and the cut-off switch.

9. A pulse light drive circuit for semiconductor metrology apparatus according to claim 8, wherein the cut-off switch is repeatedly turned on and off to generate a plurality of light pulses, each having a predetermined duration.

10. A pulse light drive circuit for semiconductor metrology apparatus according to claim 9, wherein the light detector produces a pulse light intensity signal for each of the plurality of light pulses, and the integrator integrates the pulse light intensity signals into an integrated light intensity signal.

11. A pulse light drive circuit for semiconductor metrology apparatus according to claim 10, wherein the cut-off switch cuts off energy to the pulse light source when the integrated light intensity signal of the plurality of light pulses reaches a desired preset level.

12. A semiconductor manufacturing process metrology apparatus comprising a pulse light positioned so as to direct light into a reactor chamber of a semiconductor manufacturing system, a power source, and a light detector to detect light in the reactor chamber emitted from the pulse light, the metrology apparatus further comprising:

a pulse light drive circuit connecting the power source and the pulse light, the pulse light drive circuit further comprising a trigger circuit adapted to cut off power from the power source to the pulse light after a

predetermined intensity of light is detected in the reactor chamber by the light detector.

13. A semiconductor manufacturing process metrology apparatus according to claim 12, wherein the power source comprises a capacitor, and the trigger circuit further comprises an integrator and a threshold comparator.

14. A semiconductor manufacturing process metrology apparatus according to claim 12, wherein the light detector further comprises a filter element.

15. A semiconductor manufacturing process metrology apparatus according to claim 14, wherein the filter element comprises a wavelength selective element.

16. A semiconductor manufacturing process metrology apparatus according to claim 13, wherein the light detector produces a pulse light intensity signal, and the integrator integrates the pulse light intensity signal into an integrated light intensity signal.

17. A semiconductor manufacturing process metrology apparatus according to claim 16, wherein the trigger circuit further comprises a trigger switch connected between the threshold comparator and the capacitor.

18. A semiconductor manufacturing process metrology apparatus according to claim 17, wherein the pulse light generates a light pulse having a predetermined duration, and the trigger switch cuts off power to the pulse light when the integrated light intensity signal reaches a predetermined level.

19. A semiconductor manufacturing process metrology apparatus according to claim 12, further comprising a cut-off switch connected between the power source and the pulse light, and the trigger circuit further comprises an integrator connected between the light detector and the cut-off switch.

20. A semiconductor manufacturing process metrology apparatus according to claim 19, wherein the cut-off switch is repeatedly turned on and off to generate a plurality of light pulses, each having a predetermined duration.

21. A semiconductor manufacturing process metrology apparatus according to claim 20, wherein the light detector produces a pulse light intensity signal for each of the plurality of light pulses, and the integrator integrates the pulse light intensity signals into an integrated light intensity signal.

22. A semiconductor manufacturing process metrology apparatus according to claim 21, wherein the cut-off switch cuts off power to the pulse light when the integrated light intensity signal of the plurality of light pulses reaches a predetermined level.

23. A method for effecting endpoint detection in a semiconductor wafer manufacturing process, comprising:

(a) generating one or more light pulse from a light source and introducing the at least one light pulse into a process reactor of a semiconductor wafer processing system;

(b) detecting light intensity in the process reactor with a light-detecting device, and converting the detected light intensity into a detected light intensity value;

(c) comparing the detected light intensity value with a stored desired light intensity value; and

(d) cutting off power to the light source when the stored desired light intensity value and the detected light intensity value are substantially the same.

24. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 23, further comprising filtering the one or more light pulses through a filtering element in a light detection device.

25. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 24, further comprising selecting a predetermined wavelength of the one or more light pulses that passes through the filtering element.

26. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 23, wherein detecting light intensity in the process reactor further comprises integrating the detected light intensity into an integrated light intensity value.

27. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 26, wherein the one or more light pulses each are of a predetermined duration, and the power is cut off when the integrated light intensity value reaches a predetermined level.

28. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 23, further comprising repeatedly turning on and off a switch to generate a plurality of light pulses, each having a predetermined duration.

29. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 28, further comprising integrating a detected light intensity for each of the plurality of light pulses and combining the integrated pulse light intensity signals into an integrated detected light intensity value.

30. A method for effecting endpoint detection in a semiconductor wafer manufacturing process according to claim 29, wherein power to the light source is cut off when the integrated detected light intensity signal of the plurality of light pulses reaches a predetermined level.

31. A method for improving endpoint detection in a semiconductor wafer manufacturing process using an optical monitoring device, comprising:

(a) connecting power to a light source and generating a light event in a process reactor of a semiconductor wafer manufacturing system;

(b) detecting the light event in the process reactor and converting the detected light event into a light intensity value;

(c) integrating the light intensity value into an integrated light intensity value;

(d) comparing the integrated light intensity value to a predesired light intensity value; and

(e) disconnecting the power to the light source when the integrated light intensity signal and the predetermined light intensity signal are the same.

32. A method for improving endpoint detection in a semiconductor wafer manufacturing process using an optical monitoring device according to claim 31, wherein generating a light event further comprises generating a single light pulse having a predetermined duration.

33. A method for improving endpoint detection in a semiconductor wafer manufacturing process using an optical monitoring device according to claim 31, wherein generating a light event comprises generating a plurality of light pulses each having a duration shorter than a duration of the light event.

34. A method for improving endpoint detection in a semiconductor wafer manufacturing process using an optical monitoring device according to claim 33, wherein detecting the light event comprises:

(a) detecting each light pulse; and

(b) converting each detected light pulse into a light intensity value.

35. A method for improving endpoint detection in a semiconductor wafer manufacturing process using an optical monitoring device according to claim 34, wherein integrating the light intensity signal comprises integrating each light

intensity signal into a plurality of integrated pulse light intensity signals, and combining the plurality of integrated light intensity signals to obtain the integrated light intensity signal.